

Application No. 09/825,128
Amendment dated December 22, 2003
Reply to Office Action of October 22, 2003

RD-27903/USA

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1-10. (Canceled)

11. (Currently amended) ~~The~~A method of treating a rigid die insert to reduce crack propagation and raise yield stress therein, the rigid die insert comprising a nickel-base superalloy having a plurality of gamma-prime particles, each of the gamma-prime particles having a particle size, the method comprising the steps of:

- a) providing the rigid die insert;
- b) dissolving gamma-prime particles having a first particle size, by:
 - i) ~~Claim 9, wherein the step of heat treating the rigid die insert in an inert atmosphere at a first predetermined temperature further comprises for a first predetermined hold time, the first predetermined temperature being a sub-solvus temperature of the nickel-base alloy; and~~
 - ii) ~~forced-air cooling the rigid die insert immediately after heat treating the rigid die insert at a first predetermined temperature and quenching the rigid die insert to room temperature in a room temperature bath immediately after forced-air cooling from the first predetermined temperature; and~~
- c) ~~growing additional gamma-prime particles in the rigid die insert, wherein each of the additional gamma-prime particles has a second particle size, the second particle size being smaller than the first particle size.~~

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wherein the particle size of each of the plurality of gamma-prime particles is refined to produce a uniform size distribution of the gamma-prime particles, thereby reducing crack propagation and raising the yield stress of the rigid die insert.

12. (Currently amended) The method of Claim [[9]]11, wherein the inert atmosphere is an argon atmosphere.

13. (Currently amended) The method of Claim [[9]]11, wherein the step of quenching the rigid die insert to room temperature in a room temperature bath comprises quenching the rigid die insert to room temperature in a room temperature oil bath.

14. (Currently amended) The method of Claim [[9]]11, wherein the step of growing additional gamma-prime particles in the rigid die insert comprises aging the rigid die insert in an inert atmosphere at a second predetermined temperature for a second predetermined hold time, wherein the second predetermined temperature is less than the first predetermined temperature.

15. (Original) The method of Claim 14, wherein the inert atmosphere is an argon atmosphere.

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16. (Currently amended) A method of refining the particle size of gamma-prime particles in a Rene 95 superalloy, the method comprising the steps of:

- a) providing a Rene 95 superalloy;
- b) heating the Rene 95 superalloy in an inert atmosphere at a first temperature, the first temperature being a temperature below a solvus temperature of the Rene 95 superalloy;
- c) immediately quenching the Rene 95 superalloy from the first predetermined temperature to room temperature in a bath and dissolving gamma-prime particles[[,]] in the Rene-95 superalloy, wherein each of the gamma-prime particles has a first particle size; and

aging the Rene 95 superalloy after quenching in an inert atmosphere at a second predetermined temperature for a second predetermined hold time, wherein the second predetermined temperature is less than the first predetermined temperature, and growing additional gamma-prime particles, wherein each of the additional gamma-prime particles has a second particle size that is less than the first particle size, and wherein a uniform size distribution of gamma-prime particles is created.

17. (Previously presented) The method of Claim 16, wherein the step of heating the Rene 95 superalloy in an inert atmosphere at a first temperature comprises heating the Rene 95 superalloy to about 2050°F for about two hours.

18. (Previously presented) The method of Claim 16, wherein the step of quenching the Rene 95 superalloy to room temperature in a bath comprises quenching the Rene 95 superalloy in a room temperature oil bath.

19. (Previously presented) The method of Claim 16, wherein the step of aging the Rene 95 superalloy in an inert atmosphere at a second predetermined temperature for a second predetermined hold time comprises heating the Rene 95 up to about 1400°F for about 16 hours.

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20. (Original) The method of Claim 16, wherein the inert atmosphere is an argon atmosphere.

21. (Previously presented) A method of treating a rigid die insert to reduce crack propagation and raise yield stress, the rigid die insert comprising a Rene 95 superalloy having a plurality of gamma-prime particles, each of the gamma-prime particles having a particle size, the method comprising the steps of:

- a) providing the rigid die insert;
- b) heating the rigid die insert in an inert atmosphere at a first temperature for a first predetermined hold time, the first temperature being a temperature below a solvus temperature of the Rene 95 superalloy;
- c) immediately forced-air cooling the rigid die insert from the first temperature;
- d) quenching the rigid die insert at room temperature in a bath immediately following the step of forced-air cooling and dissolving gamma-prime particles in the Rene-95 superalloy, wherein each of the gamma-prime particles has a first particle size; and
- e) aging the rigid die insert in an inert atmosphere at a second predetermined temperature for a second predetermined hold time, wherein the second predetermined temperature is less than the first predetermined temperature,

wherein the particle size of each of the plurality of gamma-prime particles is refined and a uniform size distribution of gamma-prime particles is created, thereby reducing crack propagation and raising the yield stress of the rigid die insert.

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22. (Original) The method of Claim 21, wherein the step of quenching the rigid die insert in a room temperature bath comprises quenching the rigid die insert in a room temperature oil bath.

23. (Original) The method of Claim 21, wherein the step of heating the rigid die insert in an inert atmosphere to a first temperature for a first predetermined hold time comprises heating the rigid die insert to about 2050°F for about two hours.

24. (Previously presented) The method of Claim 21, wherein the step of aging the rigid die insert in an inert atmosphere at a second predetermined temperature for a second predetermined hold time comprises heating the rigid die insert up to about 1400°F for about 16 hours.

25. (Original) The method of Claim 21, wherein the inert atmosphere is an argon atmosphere.